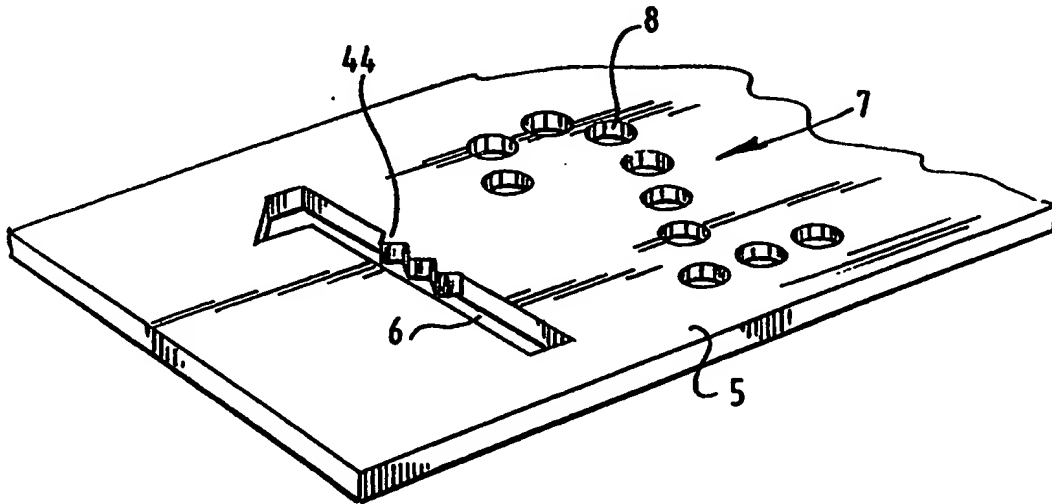




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(21) International Application Number: PCT/NL95/00119 (22) International Filing Date: 29 March 1995 (29.03.95) (30) Priority Data: 9400498 29 March 1994 (29.03.94) NL (71) Applicant (for all designated States except US): INDUSTRIAL AUTOMATION INTEGRATORS (IAI) B.V. [NL/NL]; De Run 5408, NL-5504 DE Veldhoven (NL). (72) Inventors; and (75) Inventors/Applicants (for US only): COBBEN, Johannes, Ignatius, Marie [NL/NL]; Berthastraat 11, NL-5507 LT Veldhoven (NL). AUGUSTINUS, Arnoud [NL/NL]; Heilige Geeststraat 2, NL-5521 LC Biersel (NL). (74) Agent: EVELEENS MAARSE, Pieter, Arnold & Siedsma, Sweelinckplein 1, NL-2517 GK Den Haag (NL).			(81) Designated States: US, European patent (AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE). Published <i>With international search report.</i> <i>In English translation (filed in Dutch).</i>

(54) Title: **CARRIER REPRESENTING VALUE AND COMPRISING PATTERNS APPLIED BY A LASER BEAM**

(57) Abstract

The invention relates to a carrier representing value (5) provided with recognizable patterns, for instance in the form of giro cheques (1) bankcheques, eurocheques, banknotes, shares, bonds and other documents representing a value, wherein the patterns are formed by parts treated by means of a laser beam (20, 21). This object is reached in that the patterns have been provided by means of a laser light beam (20, 21). The use of a laser beam (20, 21) makes it possible to apply particularly fine structures which either cannot be applied with other treating methods, or only with the greatest financial effort. The use of laser beams (20, 21) moreover enables variation of the width or depth of the channels or perforations (6, 7), which is almost impossible with other treating methods.

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**CARRIER REPRESENTING VALUE AND COMPRISING PATTERNS APPLIED
BY A LASER BEAM**

The invention relates to a carrier representing value, comprising patterns, which are forgery proof, and which are at least partially recognizable with the eye, and in which the patterns provided by a laser beam have such a structure, 5 that they cannot be applied on the carrier representing value by other processes, or only with the greatest difficulties.

Such carriers representing value are generally known, for instance in the form of giro cheques, bank cheques, 10 eurocheques, banknotes, credit cards, shares, bonds and other documents representing a value. The invention otherwise also relates to other types of documents representing a value such as passports, driving licenses and the like.

15 It is known problem that carriers representing value are forged and falsified. This is becoming an increasingly more significant problem. A constant attempt is made here to keep one step ahead of the forgers. In recent times the use of colour copiers has made increasingly easier forging of 20 documents otherwise difficult to counterfeit, this in principle without too many problems.

The object of the present invention is therefore to provide steps with which carriers representing value are more difficult to forge, so that it is at least temporarily 25 possible to remain one step ahead of the forgers.

"This object is achieved in that patterns have been provided by means of a laser beam."

It will be apparent that these steps make difficult the falsification of carriers representing value.

30 The use of a laser beam makes it possible to apply particularly fine structures which either cannot be applied with other treating methods, or only with the greatest financial effort.

~~The use of laser beams moreover enables variation of the width or depth of the channels or perforations, which is almost impossible with other treating methods.~~

Falsification is further difficult because it is almost impossible to fill in the thus resulting grooves or perforations. Should this nevertheless be achieved, it is then easy to see that there has been tampering. Laser technique furthermore offers the option of providing per se visible patterns with added, invisible patterns which can only be seen with assist means and in which information can be recorded.

The attention is drawn that the patterns are individualizable. This means, that the carriers are each on their own or each group of for instance ten carriers are provided of the same pattern. Such a situation arises for instance with bank cheques or giro cheques, which can be provided of an indication of the account number, and which can be provided with a consecutive number for each of the account numbers. Such carriers representing value are usually produced in groups of 10, 15 or 20 pieces. Of course, such carriers representing value are prepared in substantial quantities. The providing of such individualized patterns on such carriers representing value arises large problems in view of the required substantial speed of production; by the application of laser light these problems are avoided; a laser light source is indeed quickly controllable, so that each giro cheque or cheque can be provided of an individualizable pattern.

As stated before the carriers representing value can be made of paper, of plastic or of another material, for instance textile.

According to a preferred embodiment the patterns are so fine, that these can at least partially only be made visible by means of appliances.

According to another preferred embodiment the patterns are applied in the form of perforations or channels applied by a laser beam.

According to again another preferred embodiment the patterns applied to the carrier representing value are generally personalized.

5 The invention further relates to a device for applying individualizable recognizable patterns to carriers representing value, comprising a modulable and controllable laser light source for generating a laser beam applying patterns to the carriers representing value and control means for controlling and modulating the laser light source.
10 The quantities for modulation are the intensity, focussing, polarization and wavelength of the laser beam.

The present invention will be elucidated hereinbelow with reference to the annexed figures, wherein:

figure 1 shows a view of a giro cheque which is provided according to the present invention with perforations applied by a laser beam;
15

figure 2 shows an enlarged part view of a paper representing value, for instance a credit card, provided with a perforation according to the present invention;

20 figure 3 shows a paper representing value, for instance a credit card, provided with a channel according to the invention applied by a laser beam;

figure 4 is a schematic perspective view of a combination of a printing apparatus and a laser perforation device according to the present invention;
25

figure 5 is a perspective view of the most important components of a laser perforation device according to the invention;

figure 6 is a schematic perspective view of the components of the device shown in figure 5 for controlling the laser beam.
30

Shown in figure 1 is a giro cheque 1 which is formed by a sheet of paper to which a colour printing is applied. The colour printing is of course designed and executed such that imitation thereof is made as difficult as possible. This
35 printing is otherwise the same for all giro cheques.

Further applied to the giro cheque is a personalized printing which is formed by name, postal code, home address

and giro number of the user of the giro cheques, while the giro cheque can also be provided with an individual serial number. Some of this personal information can be printed on the giro cheque in different ways; generally the bottom white strip 3 of the giro cheque is thus generally provided once again with the giro number of the user.

Up to this point the described giro cheques correspond with the giro cheques in general use at the present.

According to the present invention the giro cheques are however provided with a perforation 4 which is formed in the present embodiment by the giro number. It is of course possible to use other data, such as a postal code or the name of the user.

It is however not per se essential to the invention for personalized data to be used for the perforation according to the invention; it is equally possible to apply a general perforation, for instance in the form of a symbol or pattern.

It is noted herein that the advantage of the invention lies particularly in the poor forgery potential of a paper representing value according to the invention; the perforation is chosen such that it can only be applied with laser equipment; for example through the choice of dimensions, sharp bends and the like the perforation is chosen such that it cannot be applied by mechanical means. This means that the potential forger would have to have laser equipment at his disposal, which would entail large investment in terms of finance and technological expertise.

It will be apparent that different types of perforation can be applied. Figure 2 thus shows a paper representing value 5 in which a perforation 6 is applied in the form of a continuous number 1, and a perforation 7 in the form of separate circles 8. The points 8 are herein selected for instance such that they are precisely round and this roundness is clearly visible to the naked eye.

The use of laser beams enables addition of additional information, for instance in the form of a wave-like boundary line 44 of the perforation. This wave line, which

is not visible to the naked eye, can contain personalized information which may be useful for instance in solving criminal offenses.

Figure 3 thus shows a credit card 9 in which a numeral three 10 is arranged by applying a V-shaped channel in the material in the form of the numeral three. The laser beam has an intensity herein such that the material is not perforated but wherein only a channel is arranged. A numeral four 11 consisting of separate elements is applied in similar manner. Additional information can also be added here, for instance in the form of local, fine patterns.

In this embodiment blackened spots 42 are further applied adjoining the recessed grooves. In order to apply the blackened spots 42 laser light is used with a still smaller intensity. It is otherwise also possible to locally pretreat the card 9, for instance with the printing press, to obtain the desired colouring, in this case blackening.

According to a preferred embodiment the carriers representing value are stacked in row and subsequently for each stack the patterns are applied on the carriers representing value. Of course, the carriers representing value will each be provided with substantially the same pattern. This embodiment is for instance suitable for giro cheques or for bank cheques, which can on this way each be provided of the account number of the client. Of course, it is not possible to provide an individualizing pattern within the stack in the same process. It is noted, that by the fact, that a laser beam is never completely parallel, the pattern of the upper carrier representing value within the stack will be wider than the pattern of the lowest carrier representing value within the stack. It speaks for itself, that the patterns are provided by the removal of material. From the stack a V-shaped amount of material is taken away. As a consequence thereof a rate of individualizing develops within each stack; as stated, more material has been taken away from the upper carrier representing value than from the lowest carrier representing value.

This configuration in which a stack of carriers representing value is provided of a pattern simultaneously is, however, only applicable when the carrier representing value is thin enough.

5 It is possible prior to performing the treatment by the laser beam to subject the substrate of the carrier, thus for instance the paper, to a pretreatment whereby the substrate becomes sensitive to laser light with the intensity for applying the desired patterns. After these patterns have
10 been applied the desired sensitivity can be terminated by a suitable treatment. It is also possible that the sensitivity to laser light only lasts for a determined period. In addition, the substrate can already be made sensitive to laser light during production and this sensitivity
15 terminated again after application of the patterns.

As noted, the invention relates also to carriers representing value in the form of credit card like cards. In this instance the perforation is applicable, for instance with patterns which cannot be or only with the greatest
20 difficulties be provided of otherwise, for instance mechanically, for instance characters.

Depicted in figure 4 is printing apparatus 12 used for printing giro cheques with personalized data. The printing apparatus otherwise forms part of the prior art and is
25 described here only insofar as is necessary to elucidate the present invention. The giro cheques are supplied in the form of zigzag-stacked continuous paper 13 which is fed to the printing apparatus 14 by means of a tensioning device. In the printing apparatus 12 the continuous paper 13 is
30 transported over a substantially horizontally extending path not shown in the drawing, wherein it is printed with the personalized data by a printing device 15, it then passes through the laser device 16 according to the present invention, thereafter undergoes in a device 17 a finishing
35 treatment forming part of the printing process, whereafter it emerges at the rear of the printing apparatus 12. The whole printing apparatus according to the present embodiment is adapted to simultaneously print and treat two giro

cheques fed in the form of the double array of continuous paper 13.

The construction of the laser device is shown in more detail in figure 5. As can be seen in figure 5, the laser device 2 comprises laser sources 18,19 which are both disposed such that at the top the laser beam 20,21 exits through an exit aperture 22 respectively 23. This arrangement is chosen to enable accommodation of the laser device in the available space. The laser beams 20,21 are then reflected by means of a mirror 24,25 and deflected at an angle of 90°, they pass through a shutter 26 respectively 27 and are subsequently deflected downward by mirrors 28,29.

The parallel laser beams 20 respectively 21 then pass through a focussing device 30 respectively 31 whereby focussing of the relevant laser beams takes place. The laser beams then pass to a mirror 32 respectively 33 whereby they are deflected and fed to the deflecting devices 40 respectively 41. In the deflecting devices 40,41 the laser beams 20,21 are carried to the relevant location on the continuous paper 13 where they perform the operation according to the invention.

The device further comprises a detector 43 which responds to reference marks arranged on the continuous paper for generating a synchronization signal for the purpose of synchronizing the control of the laser beams with the movement of the continuous paper. This is particularly important when the transport speed of the continuous paper is not constant.

The operation will now be elucidated with reference to figure 6. Arranged in the focussing device 30 is a lens which focuses the parallel laser beam coming from the laser light source 18 on the position 34 where the laser beam 20 contacts the continuous paper for perforating. Means are herein provided for moving the lens 35 upward or downward to always keep constant the optical distance between lens 35 and the contact position 34, and thus keep the laser beam focussed on the contact position 34. The location of the contact position 34 is in any case always changing.

The deflecting device 40 is formed by a first galvanometer 36 which is connected to a mirror 37 with which the location of the contact position 34 can be moved in the direction of movement of the continuous paper 13, and a
5 second galvanometer 38 which is connected to a mirror 39 with which the location of the contact position 34 can be moved in transverse direction of the direction of movement of the continuous paper 13.

It will be apparent that with the thus shown device any
10 random pattern can be applied to the continuous paper by means of perforation. The intensity modulation of the relevant laser beam 20 respectively 21 must of course take place herein in order to be able to jump from the one figure to the other.

15 According to another preferred embodiment the same pattern is more than once, for instance twice, applied on the same carrier representing value, in which the patterns are relatively slightly shifted. This is for instance attractive, when a wide pattern has to be applied. This
20 configuration also applies when stacks of carriers representing value are formed, and the energy of a single laser beam is not sufficient for removing the material of the whole stack.

The entire beam manipulation can otherwise be performed
25 by the units 30,40 and the intensity modulation such that the perforation operation takes place during the movement of the continuous paper. It is herein assumed in the first instance that the movement takes place uniformly. When it is anticipated that the movement will not take place uniformly,
30 for instance as a result of the foregoing, the control can be adapted subject to the speed. Means must then of course be provided for measuring the speed of the paper to be used.

It will be apparent that the above described device can
35 not only be used for perforating or for applying channels or other markings in paper, but also, albeit with the necessary modifications, for applying such markings on other materials, for instance plastic in the case of credit cards

and/or credit card-like carriers representing value, or metal in the case of coins.

CLAIMS

1. Carrier representing value, comprising individualizable patterns, which are at least partially recognizable by the eye, and in which the patterns provided by a laser beam have such a structure, that they cannot or
5 only with the greatest difficulties be applied on the carrier representing value with other process, **characterized in that** the patterns have been provided by means of a laser light beam.

2. Carrier representing value as claimed in any of the
.10 foregoing claim 1, **characterized in that** the patterns are so fine that they are at least partially visible only with the aid of assist means.

3. Carrier representing value as claimed in claim 1 or 2, **characterized in that** the patterns are formed at least
15 partially by parts removed by the laser beam.

4. Carrier representing value as claimed in claim 3, **characterized in that** the patterns are formed at least partially by perforations applied by a laser beam.

5. Carrier representing value as claimed in claim 3,
20 **characterized in that** the patterns are formed at least partially by channels applied by the laser beam.

6. Carrier representing value as claimed in claim 3, 4 or 5, **characterized in that** the depth of the removed parts differs.

25 7. Carrier representing value as claimed in claim 3, 4, 5 or 6, **characterized in that** the breadth of the removed parts differs.

8. Carrier representing value as claimed in claim 1, 2 or 3, **characterized in that** the parts treated by a laser
30 beam are formed at least partially by parts coloured by the laser beam.

9. Carrier representing value as claimed in any of the foregoing claims, **characterized in that** the carrier is

insensitive to laser light with substantially the same properties as the laser beam used to apply the patterns.

10. Carrier representing value as claimed in claim 9, characterized in that after application of the pattern the carrier is made insensitive to laser light with the relevant properties.

11. Carrier representing value according to one of the preceding claims, characterized in that the carrier representing value has been made of plastic.

12. Carrier representing value according to one of the preceding claims, characterized in that the carrier representing value has been made of paper.

13. Stack of carriers representing value according to claim 12, characterized in that the patterns provided on each of the stacked carriers representing value are substantially equal, and are located above each other.

14. Stack of carriers representing value according to claim 13, characterized in that the patterns are narrower with each deeper carrier representing value.

15. Device for providing individualizable recognizable patterns on carriers representing value, comprising:

- a laser light source with a controllable strength and being controllable in the plain of the carrier representing value for generating a laser light beam providing patterns on the carriers representing value;
- and control means for controlling the laser light source.

16. Device as claimed in claim 15, characterized in that the device comprises transporting means for the carriers and that the control means are adapted to control the laser light source such that the recognizable patterns are applied to the carriers during movement of the carriers.

17. Device as claimed in claim 14 or 15, characterized in that the laser light source is adapted to remove material from the carriers.

18. Device as claimed in claim 15, 16 or 17, characterized in that the laser light source is provided with focussing means.

19. Device as claimed in claim 18, **characterized in that** the focussing means are formed by a focussing lens which is movable in the direction parallel to the laser beam, and by control means for keeping constant the optical
5 distance between the focussing lens and the carriers.

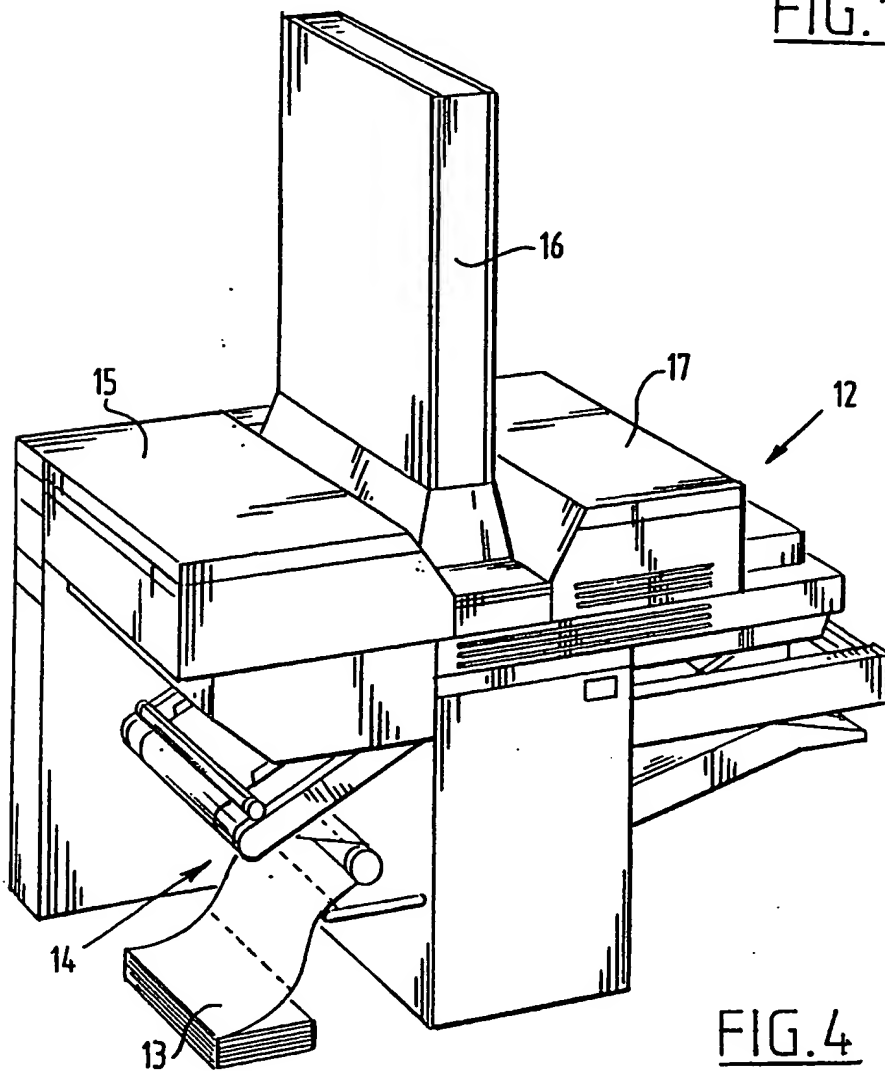
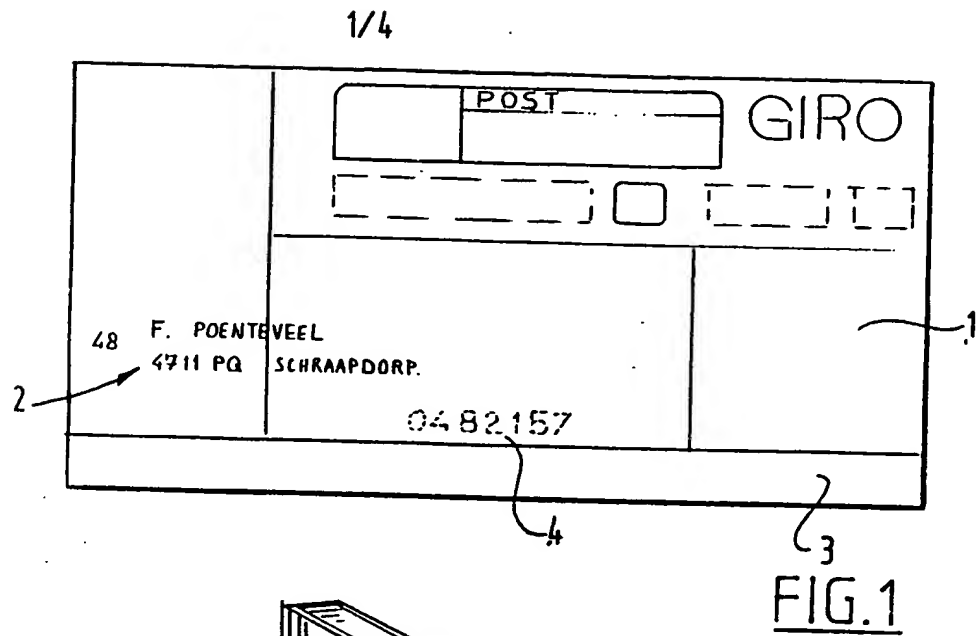
20. Device as claimed in any of the claims 15-19, **characterized in that** the device is fit for providing patterns on stacked carriers representing value.

21. Device as claimed in any of the claims 15-20,
10 **characterized in that** the control means are provided with a scanner for scanning the speed of the carriers and that the control means are adapted to control the laser beam subject to the speed of the carriers.

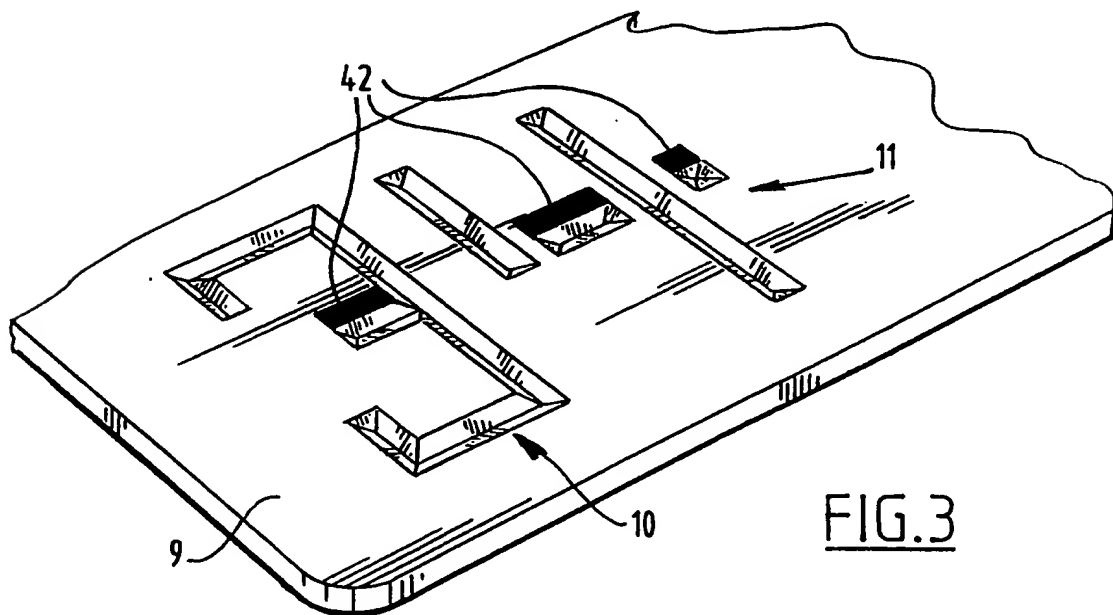
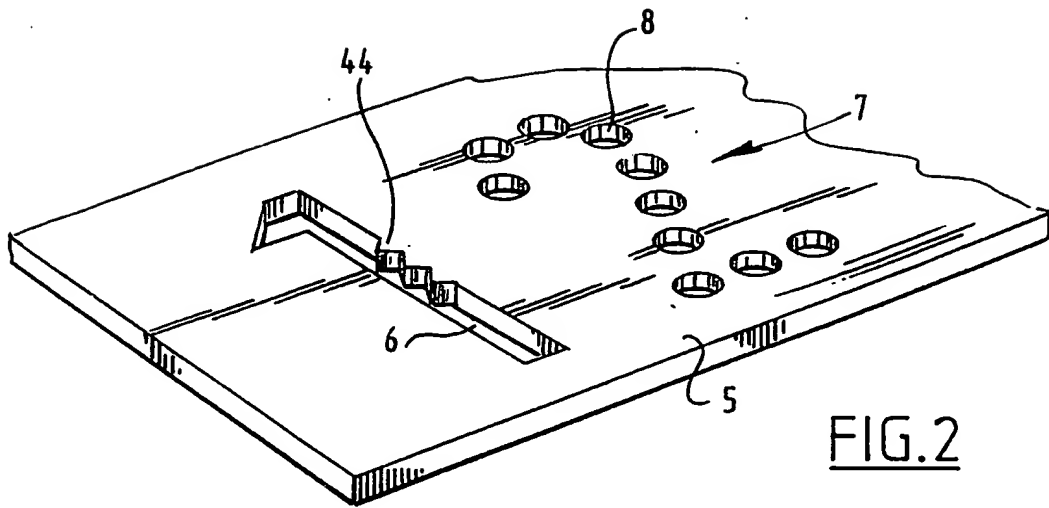
22. Device as claimed in any of the claims 15-21,
15 **characterized in that** the device is provided with a suction hood for drawing off vapours formed by the laser operation.

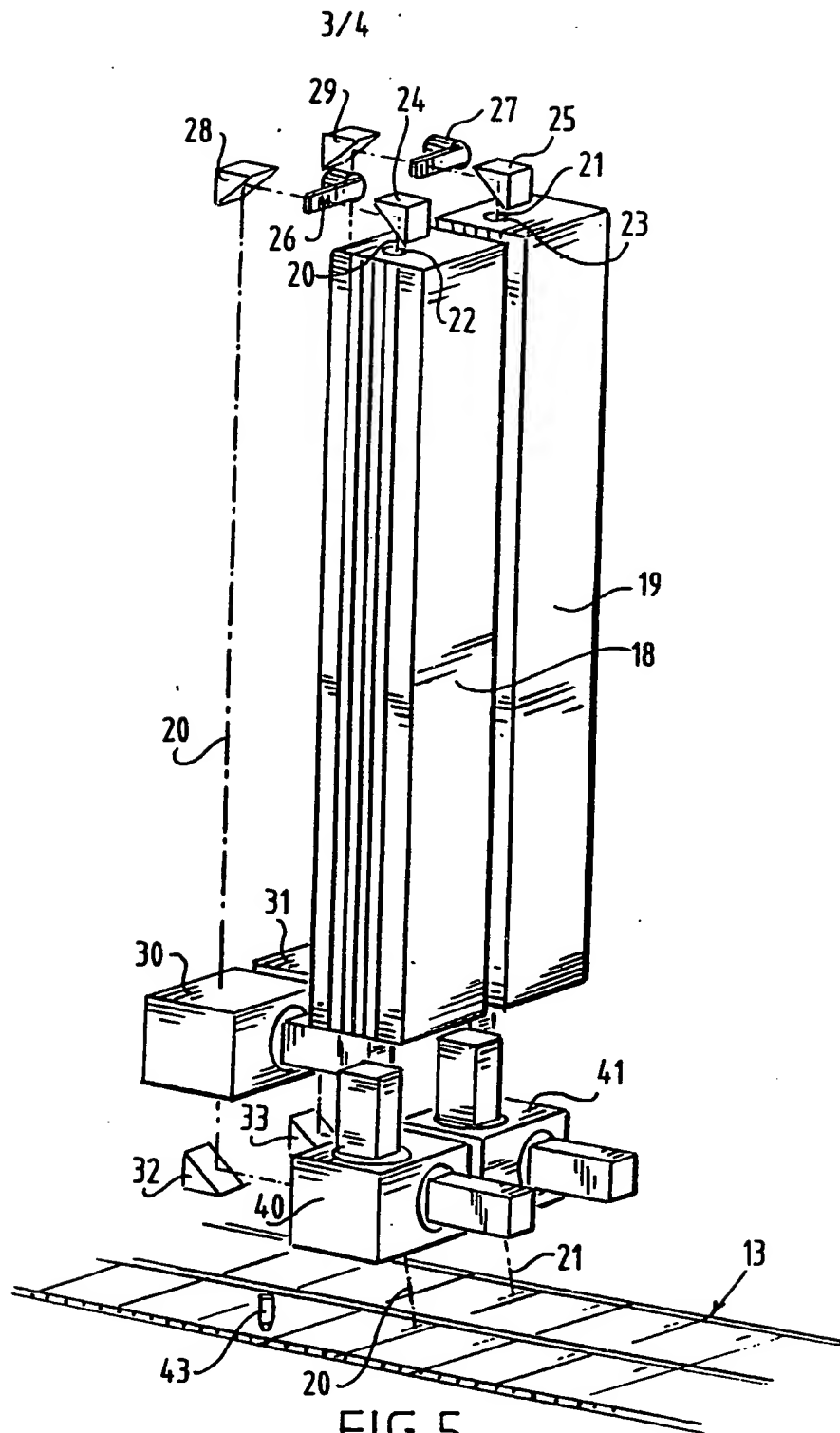
23. Device as claimed in any of the claims 15-22, **characterized in that** the device is adapted for mounting on a printing apparatus provided with transporting means.

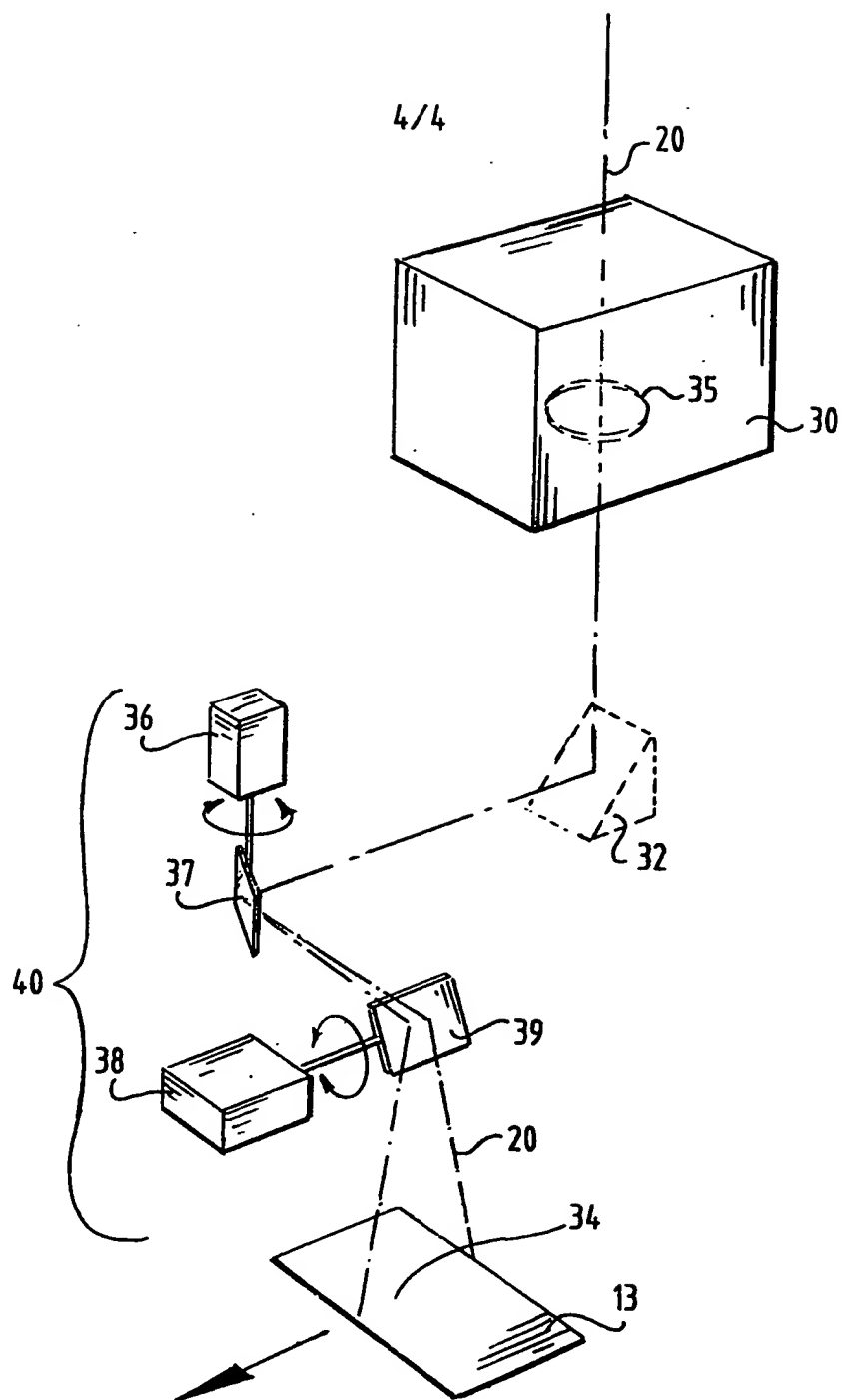
20 24. Device as claimed in any of the claims 15-23, **characterized in that** the device is fit for providing patterns of stacked of carriers representing value.



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FIG. 6

INTERNATIONAL SEARCH REPORT

International Application No

PCT/NL 95/00119

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 B42D15/10 B42D15/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 6 B42D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	GB,A,2 111 910 (GAO) 13 July 1983 see the whole document ---	1-6, 15-24
Y	US,A,4 939 888 (KATZ ET AL.) 10 July 1990 see column 3, line 54 - line 63; figure 5 ---	1-6, 15-24
A	EP,A,0 123 163 (GAO) 31 October 1984 see the whole document ---	1
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Date of the actual completion of the international search

14 June 1995

Date of mailing of the international search report

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NL - 2280 HV Rijswijk
Tel. (+ 31-70) 340-2040, Tx. 31 651 epo nl,
Fax: (+ 31-70) 340-3016

Authorized officer

Evans, A

INTERNATIONAL SEARCH REPORT

International Application No

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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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